Resin Composites: Properties, Production and Applications, 2011, pages 213-230

Fabrication of epoxy resin composites with metal nanoparticles

Stepanov A.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

A review of recent results on a fabrication of epoxy resin composites with metal nanoparticles using viscous properties of polymer is reported. Preparation of metal nanoparticles realized during thermal vacuum evaporation of silver onto the surface of epoxy resin at a viscosity from 20 to 120 Pas) having room tempetature, which is well below the glass transition temperature of the polymer. Additionally, for synthesis of metal nanoparticles the ion irradiation of viscous polymer matrix is used. The viscous epoxy resin is implanted by silver ions with diferent doses. As a result, epoxy resin layers containing silver nanoparticles in their volume are fabricated. Various types of disperse structures formed by metallic nanoparticles in the polymer are detected. The morphology of the composite material is found to be controlled by the polymer viscosity and the metal deposition time. The use of the viscous state of epoxy resin increases the diffusion coefficient of silver impurity, which stimulates the nucleation and growth of nanoparticles and allows a high filling factor of metal in the polymer to be achieved. Mechanisms of metal nanoparticle growth in viscous epoxy resin are discussed.